THE OFFICE OF REGULATORY STAFF

DIRECT TESTIMONY & EXHIBIT

OF

WILLIE J. MORGAN

MAY 22, 2018

DOCKET NO. 2018-1-E

ANNUAL REVIEW OF BASE RATES FOR FUEL COSTS OF DUKE ENERGY PROGRESS, LLC.

DIRECT TESTIMONY AND EXHIBITS OF

WILLIE J. MORGAN, P.E.

ON BEHALF OF

THE SOUTH CAROLINA OFFICE OF REGULATORY STAFF

DOCKET NO. 2018-1-E

IN RE: ANNUAL REVIEW OF BASE RATES FOR FUEL COSTS OF

DUKE ENERGY PROGRESS, LLC

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS AND OCCUPATION.

A. My name is Willie J. Morgan and my business address is 1401 Main Street, Suite 900, Columbia, South Carolina 29201. I am employed by the South Carolina Office of Regulatory Staff ("ORS") as the Deputy Director of the Utility Rates Department.

Q. PLEASE STATE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A. I received a Bachelor of Science Degree in Electrical Engineering from the University of South Carolina in 1985 and a Master of Arts Degree in Management from Webster University in 2000. I am a licensed Professional Engineer registered in the State of South Carolina. I was employed by the South Carolina Department of Health and Environmental Control ("DHEC") as an Environmental Engineer Associate. Later, I was promoted to the position of Permitting Liaison where I assisted industries and the public with environmental permitting requirements in the State of South Carolina. This assistance included providing information about air quality, solid and hazardous waste management, and water and wastewater management requirements. I was employed by DHEC for nineteen (19) years. In October 2004, I joined ORS as the Program Manager for the Water

and Wastewater Department and was promoted to Deputy Director in 2015. Collectively, I have over thirty-two (32) years of regulatory compliance experience providing assistance and oversight for various types of regulated utilities. I am the immediate past-President of the South Carolina Society of Professional Engineers – Columbia Chapter.

Q. HAVE YOU TESTIFIED PREVIOUSLY BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA ("COMMISSION")?

A. Yes. I have testified on numerous occasions before the Commission regarding hearings concerning general rate cases and other proceedings.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to set forth ORS's recommendations resulting from our examination and review of Duke Energy Progress, LLC's ("DEP" or "Company") fuel expenses and power plant operations used in the generation of electricity to meet the Company's South Carolina retail customer requirements during the review period. The review period includes the actual data for March 2017 through February 2018 ("Actual Period"), estimated data for March 2018 through June 2018 ("Estimated Period"), and forecasted data for July 2018 through June 2019 ("Forecasted Period").

Q. WHAT DID YOUR REVIEW OF THE COMPANY'S FUEL EXPENSES AND PLANT OPERATIONS INVOLVE?

A. ORS examined various fuel and performance related documents as part of our review. These documents addressed the Company's electric generation and power plant outage and maintenance activities. In preparation for this proceeding, ORS analyzed the Company's monthly fuel reports including power plant performance data, unit outages and generation statistics. ORS examined the Company's contracts for nuclear fuel, coal,

natural gas, fuel oil, transportation, and environmental reagents. ORS also evaluated the Company's policies and procedures for fuel procurement. All information was reviewed with reference to the Company's existing Adjustment for Fuel, Variable Environmental, Avoided Capacity, S.C. Code Ann. §58-27-865 (the "Fuel Clause Statute"), and the approved South Carolina Distributed Energy Resource Program ("DERP"). Additionally, ORS attended the April 24, 2018, Nuclear Regulatory Commission ("NRC") 2017 post-annual inspection meeting for the Robinson Nuclear Plant in Hartsville, SC.

Q. WHAT ADDITIONAL STEPS WERE TAKEN IN ORS'S REVIEW OF THE COMPANY'S PROPOSAL?

A. ORS met with Company personnel from various departments to discuss and review fossil and nuclear fuel procurement, fuel transportation, environmental compliance costs and procedures, emission allowances, generation plant performance, distributed energy resources, forecasting, and general Company policies and procedures pertaining to fuel procurement. In addition, ORS monitored the nuclear, coal, natural gas, transportation and renewable industries through industry and governmental publications.

Q. DID ORS EXAMINE THE COMPANY'S PLANT OPERATIONS FOR THE ACTUAL PERIOD?

A. Yes. ORS reviewed the performance of the Company's generation units to determine if the Company made reasonable efforts to maximize unit availability and minimize fuel costs. ORS also reviewed the operating statistics of the Company's power plants by unit. Exhibit WJM-1 shows, in percentages, the annual availability, capacity, and forced outage factors of the Company's major generation units during the Actual Period. This Exhibit also includes the North American Electric Reliability Corporation

("NERC") national five-year (2012-2016) averages for availability, capacity, and forced outage factors for each type of generation plant.

Q. PLEASE EXPLAIN HOW THE OUTAGES ARE REPRESENTED ON EXHIBITS WJM-2 THROUGH WJM-4.

A. Exhibits WJM-2 and WJM-3 summarize outages lasting seven (7) or more days for major coal and natural gas units during the Actual Period, respectively. While not all plant outages were included in these exhibits, all outages were reviewed and found to be reasonable by ORS. Exhibit WJM-4 summarizes all outages at the Company's nuclear plants during the Actual Period. There were seven (7) separate outages involving DEP's nuclear units, including two (2) scheduled refueling outages, one (1) maintenance outage, and three (3) forced outages during the Actual Period. ORS noted one (1) refueling outage was extended beyond the scheduled restart date. This extension was due primarily to issues that emerged during the outage and needed to be addressed while the unit was offline. ORS reviewed each outage and extension, including associated NRC documents, and discussed these outages with Company management. The three (3) nuclear stations, which house a total of four (4) units, achieved an overall average availability factor of 94.5% and an average capacity factor of 94.6% for the Actual Period, as shown in Exhibit WJM-1.

Q. WHAT WERE THE RESULTS OF YOUR ANALYSIS OF THE COMPANY'S POWER PLANT OPERATIONS FOR THE ACTUAL PERIOD?

A. ORS's review of the Company's operation of its generation facilities during the Actual Period revealed the Company made reasonable efforts to maximize unit availability and minimize fuel costs.

Q. DID ORS REVIEW THE COMPANY'S GENERATION MIX DURING THE ACTUAL PERIOD?

A. Yes. Exhibit WJM-5 shows the generation mix for the Actual Period by percentage and generation type. As shown in this exhibit, the nuclear, coal, and natural gas plants contributed an average of 41.67%, 12.83% and 32.32%, respectively, of the Company's generation throughout the Actual Period. This equates to approximately 86.82% of the Company's generation for the Actual Period. The remainder of the generation was met through a mix of hydroelectric, renewables, purchased power, and Joint Dispatch Agreement ("JDA") purchases.

Q. DID ORS REVIEW THE COMPANY'S FUEL COSTS ON A PLANT-BY-PLANT BASIS FOR THE ACTUAL PERIOD?

A. Yes. Exhibit WJM-6 shows the average fuel costs for the major generation plants on the Company's system for the Actual Period and the megawatt-hours ("MWh") produced by those plants. The chart shows the lowest average fuel cost of 0.670 cents/kilowatt-hour ("kWh") at Brunswick Nuclear Station and the highest average fuel cost of 3.920 cents/kWh at the Mayo plant. The Company utilizes economic dispatch which generally requires the lower cost units be dispatched first.

Q. DID ORS REVIEW THE COMPANY'S ENVIRONMENTAL COMPLIANCE RELATED COSTS?

A. Yes. ORS reviewed the Company's environmental compliance related costs including allowances for nitrogen oxide ("NO_X") and sulfur dioxide ("SO_2") emissions, reagents (i.e., limestone, ammonia, urea, etc.), and chemicals used in the reduction of these emissions. The use of these chemicals and reagents reduces the Company's NO_X and SO_2

emissions, and the costs associated with the use of these substances are included in the Company's Adjustment for Fuel, Variable Environmental, Avoided Capacity, and DERP costs tariff as provided by the Fuel Clause Statute.

Q. DID ORS REVIEW THE ACCURACY OF THE COMPANY'S FORECAST?

A. Yes. As shown in Exhibit WJM-7, the Company's actual MWh sales were 1.24% lower than expected during the Actual Period. Exhibit WJM-8 shows, on average, the actual fuel costs for the Actual Period were 13.54% higher than the projected monthly fuel costs.

Q. DID ORS DETERMINE THE PRIMARY DRIVERS OF THE COMPANY'S REQUEST FOR A RATE CHANGE IN THIS PROCEEDING?

A. Yes. Exhibit WJM-9 shows ending period balances of base fuel, environmental, avoided capacity, and DERP avoided costs beginning in February 2009. As of February 2018, the Company had a base fuel cumulative under-recovery balance of $23,394,223, a variable environmental over-recovery balance of $616,503, avoided capacity under-recovery balance of $1,622,069, and DERP avoided costs under-recovery balance of $2,715. As shown on ORS witness Briseno's Exhibit ADB-5, page 2 of 2, ORS projects the Company to have a base fuel cumulative under-recovery balance of $22,548,514, a variable environmental over-recovery balance of $775,308, an avoided capacity under-recovery balance of $2,321,255, and a DERP avoided costs under-recovery balance of $25,676 by June 2018. The Company's request for an increase is driven primarily by these balances and increased coal prices during the Forecasted Period.

Q. WHAT CHANGES DOES THE COMPANY REQUEST TO ITS CURRENTLY APPROVED FACTORS?

A. DEP requests the Commission approve an increase to its currently approved Base Fuel Component ("Base Fuel Component") for the Forecasted Period. Additionally, the Company requests to update its Variable Environmental ("Environmental Component"), Avoided Capacity Cost Component ("Avoided Capacity Component"), and DERP Avoided Cost Component ("DERP Avoided Cost Component") to reflect the Company's forecasted expenses and allocation of these expenses to each class of customer based on its contribution to the Company's winter 2017 peak.

Q. ARE THERE ANY ADDITIONAL FACTORS IN THIS DOCKET THAT WILL IMPACT CUSTOMERS' BILLS?

A. Yes. The Company included proposed rates related to its DERP incremental expenses. ORS witness Johnson addresses the Company's incremental expenses to be recovered as a fixed charge ("DERP Charge") on customer's bills.

Q. DOES ORS RECOMMEND ANY ADJUSTMENTS TO THE FUEL FACTOR PROPOSED BY THE COMPANY?

A. No. Exhibit WJM-10 is a summary of the proposed fuel factor components for each customer class. If approved by the Commission, the rates proposed in this proceeding, including the recommended DERP Charge addressed by ORS witness Johnson, would increase the average monthly bill for a residential customer on Rate RES using 1,000 kWh from $121.58 to approximately $124.81, a net increase of $3.23 or 2.66%.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

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EXHIBIT WJM-1

Power Plant Performance Data

Duke Energy Progress, LLC

Docket No. 2018-1-E

Coal Plants	Unit	MW Rating	Actual Period Data: Average Availability Factor (%)	Average Capacity Factor (%)	Average Forced Outage Factor (%)
Asheville	1	189	73.51	36.05	5.01
Asheville	2	189	84.70	38.29	0.74
Mayo	1	727	88.21	23.87	0.39
Roxboro	1	379	86.42	30.92	1.52
Roxboro	2	671	90.45	31.68	0.62
Roxboro	3	691	88.87	38.03	0.00
Roxboro	4	698	62.51	23.59	13.37
Coal Totals		**3,544**	82.51	30.19	3.31
NERC 5-year average (All Coal Plants)			***84.76***	***56.46***	***4.67***

CC Plants[1]	Unit	MW Rating	Average Availability Factor (%)	Average Capacity Factor (%)	Average Forced Outage Factor (%)
Lee	CC1	888	97.07	80.13	0.60
Richmond	CC4	476	91.83	79.74	0.24
Richmond	CC5	597	91.69	80.93	0.37
Sutton	CC1	607	94.34	72.74	1.02
CC Totals		**2,568**	94.23	78.47	0.58
NERC 5-year average (CC Plants)			***87.68***	***53.04***	***2.62***

Nuclear Plants	Unit	MW Rating	Average Availability Factor (%)	Average Capacity Factor (%)	Average Forced Outage Factor (%)
Brunswick	1	938	99.14	98.16	0.00
Brunswick	2	932	91.12	87.88	0.41
Harris	1	932	98.21	99.33	1.79
Robinson	2	741	89.54	92.61	0.00
Nuclear Totals		**3,543**	94.50	94.60	0.55
NERC 5-year average (All Nuclear Plants)			***90.28***	***89.13***	***2.73***

[1] ***CC designates Combined-Cycle units***

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EXHIBIT WJM-2

Coal Unit Outages - 7 Days or Greater Duration

Duke Energy Progress, LLC

Docket No. 2018-1-E

Unit	Date Offline	Date Online	Hours	Outage Type	Explanation of Outage
Asheville 1	3/30/17	5/23/17	1,299.0	Planned	Unit taken offline to repair turbine and switchyard tie.
Asheville 1	5/23/17	6/5/17	313.5	Forced	Unit forced offline due to generator vibration.
Asheville 1	11/1/17	11/22/17	508.5	Planned	Unit taken offline for a planned Fall outage.
Asheville 2	9/5/17	10/27/17	1,255.4	Planned	Unit taken offline for a planned Fall outage.
Mayo 1	4/19/17	5/6/17	426.0	Planned	Unit taken offline for a planned Spring outage.
Mayo 1	9/20/17	10/13/17	573.1	Planned	Unit taken offline for a planned Fall outage.
Roxboro 1	3/1/17	3/8/17	168.0	Maintenance	Unit taken offline to replace condenser expansion joint.
Roxboro 1	10/7/17	11/13/17	889.0	Planned	Unit taken offline for a planned Fall outage.
Roxboro 2	10/14/17	11/13/17	725.4	Planned	Unit taken offline for a planned Fall outage.
Roxboro 3	4/30/17	5/7/17	184.0	Planned	Unit taken offline for a planned Spring outage.
Roxboro 3	10/14/17	10/29/17	367.6	Planned	Unit taken offline for a planned Fall outage.
Roxboro 3	11/29/17	12/7/17	193.0	Maintenance	Unit taken offline to repair turbine reheat line.
Roxboro 4	4/8/17	5/13/17	840.0	Planned	Unit taken offline for a planned Spring outage.
Roxboro 4	5/13/17	6/24/17	1,026.2	Forced	Unit forced offline due to generator problems.
Roxboro 4	10/14/17	11/26/17	1,033.0	Planned	Unit taken offline for a planned Fall outage.
Roxboro 4 [1]	2/24/18	5/27/18	2,209.0	Planned	Unit taken offline for a planned Spring outage.

[1] ***This outage was ongoing after the Actual Period.***

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EXHIBIT WJM-3

Natural Gas Unit Outages - 7 Days or Greater Duration

Duke Energy Progress, LLC

Docket No. 2018-1-E

Unit	Date Offline	Date Online	Hours	Outage Type	Explanation of Outage
Richmond CC4	3/25/17	4/9/17	362.1	Planned	Unit taken offline for a planned Spring outage.
Richmond CC4	11/4/17	11/17/17	333.2	Planned	Unit taken offline for a planned Fall outage.
Richmond CC5	4/14/17	4/29/17	340.3	Planned	Unit taken offline for a planned Spring outage.
Richmond CC5	10/7/17	10/20/17	329.1	Planned	Unit taken offline for a planned Fall outage.
Sutton CC1	5/6/17	5/17/17	275.4	Planned	Unit taken offline for a planned Spring outage.

Office of Regulatory Staff
Nuclear Unit Outages
Duke Energy Progress, LLC
Docket No. 2018-1-E

EXHIBIT WJM-4

Unit	Date Offline	Date Online	Hours	Outage Type	Explanation of Outage
Brunswick 1	4/25/17	4/29/17	75.3	Maintenance	Unit taken offline for scheduled maintenance outage to replace 1B reactor recirculating pump seal.
Brunswick 2	3/17/17	4/15/17	696.0	Planned	Unit taken offline for scheduled refueling outage.
Brunswick 2	4/15/17	4/17/17	44.2	Outage Extension	Scheduled refueling outage extended due to emergent issues.
Brunswick 2	4/18/17	4/18/17	1.9	Planned	Unit taken offline for turbine overspeed trip test.
Brunswick 2	2/16/18	2/17/18	35.5	Forced	Unit forced offline due to main generator phase 'A' no load disconnect maintenance.
Harris 1	10/22/17	10/24/17	52.3	Forced	Unit forced offline to repair lifted moisture separator reheater safety relief valve.
Harris 1	1/14/18	1/18/18	104.8	Forced	Unit forced offline due to feedwater chemistry out of tolerance.
Robinson 2 [1]	2/25/17	4/8/17	1,008.0	Planned	Unit taken offline for scheduled refueling outage.

[1] ***This outage began prior to the Actual Period.***

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Generation Mix (Percentage)

Duke Energy Progress, LLC

Docket No. 2018-1-E

EXHIBIT WJM-5

	2017										2018		
	Mar	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Average**
Nuclear	31.66	40.84	49.83	42.58	38.06	39.00	43.80	47.02	47.08	41.51	35.20	43.50	**41.67**
Coal	12.31	8.61	6.95	13.84	21.39	19.55	13.33	8.44	7.31	14.47	20.12	7.65	**12.83**
Natural Gas	37.33	31.48	29.22	30.43	29.71	29.60	31.91	31.34	35.23	34.77	31.63	35.22	**32.32**
Hydroelectric	0.63	1.48	1.55	0.77	0.41	0.32	0.47	0.60	0.63	0.54	0.71	1.59	**0.81**
Solar	0.46	0.54	0.41	0.41	0.39	0.35	0.37	0.39	0.29	0.21	0.25	0.28	**0.36**
Wind	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Biomass	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**
Purchased Power	11.04	10.79	9.45	10.01	8.81	9.22	9.03	11.18	8.78	6.88	8.56	11.04	**9.57**
JDA Purchases	6.57	6.27	2.58	1.95	1.23	1.97	1.09	1.03	0.68	1.63	3.54	0.72	**2.44**

Average total may not equal 100% due to rounding.

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EXHIBIT WJM-6

Generation Statistics for Plants

Duke Energy Progress, LLC

Docket No. 2018-1-E

Plant	Fuel Type	Average Fuel Cost (Cents/kWh) [1]	Generation (MWh)
Brunswick	Nuclear	0.670	15,240,983
Harris	Nuclear	0.692	8,080,265
Robinson	Nuclear	0.716	6,015,838
Richmond CC	Natural Gas	3.133	8,659,795
Lee CC	Natural Gas	3.458	7,362,703
Roxboro	Coal	3.513	6,690,845
Sutton CC	Natural Gas	3.811	4,570,770
Asheville	Coal	3.822	1,250,272
Mayo	Coal	3.920	1,565,829

[1] ***Includes Base Fuel Costs.***

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Comparison of South Carolina Estimated to Actual Energy Sales

Duke Energy Progress, LLC

Docket No. 2018-1-E

EXHIBIT WJM-7

		2017										2018		
		Mar	**Apr**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Period Total**
[1]	**Actual Sales (MWh)**	436,006	447,407	534,199	491,986	640,352	574,519	531,266	555,470	473,385	439,749	711,879	547,256	6,383,474
[2]	**Estimated Sales (MWh)**	527,893	491,271	470,800	542,976	600,428	637,248	558,617	499,752	472,341	491,483	595,061	575,865	6,463,735
[3]	**Difference [1]-[2]**	-91,887	-43,864	63,399	-50,990	39,924	-62,729	-27,351	55,718	1,044	-51,734	116,818	-28,609	-80,261
[4]	**Percent Difference [3]/[2]**	-17.41%	-8.93%	13.47%	-9.39%	6.65%	-9.84%	-4.90%	11.15%	0.22%	-10.53%	19.63%	-4.97%	**-1.24%**

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Comparison of South Carolina Estimated to Actual Fuel Cost

Duke Energy Progress, LLC

Docket No. 2018-1-E

EXHIBIT WJM-8

		2017										2018		
		Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Period Average
[1]	Actual Experience (¢/kWh)	2.718	2.560	2.100	2.517	2.292	2.245	1.838	1.867	1.975	2.492	4.520	1.954	2.423
[2]	Original Projection (¢/kWh)	2.431	2.171	2.171	2.350	2.263	2.174	1.949	1.816	1.902	2.181	2.187	2.009	2.134
[3]	Amount in Base (¢/kWh)	2.229	2.229	2.229	2.229	2.210	2.210	2.210	2.210	2.210	2.210	2.210	2.210	2.216
[4]	Variance from Actual [1-2]/[2]	11.81%	17.90%	-3.31%	7.11%	1.31%	3.31%	-5.73%	2.79%	3.83%	14.26%	106.66%	-2.73%	**13.54%**

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History of Cumulative Recovery Accounts

Duke Energy Progress, LLC

Docket No. 2018-1-E

EXHIBIT WJM-9

Period Ending	Base Fuel (Over)/Under	Environmental (Over)/Under	Avoided Capacity (Over)/Under	DERP Avoided Costs (Over)/Under
February-09	$ 10,347,089	$ 380,942	N/A	N/A
February-10	$ 4,129,067	$ 715,947	N/A	N/A
February-11	$ 10,418,111	$ 99,386	N/A	N/A
February-12	$ (5,129,003)	$ 367,391	N/A	N/A
February-13	$ (695,511)	$ 318,611	N/A	N/A
February-14	$ 21,559,994	$ 558,851	N/A	N/A
February-15	$ 20,760,123	$ 60,632	$ 1,799,759	N/A
February-16	$ 6,564,246	$ 364,914	$ 1,907,835	N/A
February-17	$ 6,872,181	$ 618,034	$ 893,261	$ -
February-18	$ 23,394,223	$ (616,503)	$ 1,622,069	$ 2,715

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Proposed Fuel Factors
Duke Energy Progress, LLC
Docket No. 2018-1-E

EXHIBIT WJM-10

Customer Class	Proposed Fuel Factors (¢/kWh)				
	Base Fuel Component	Environmental Component	Avoided Capacity Component	DERP Avoided Cost Component	Total Fuel Factor
Residential [1]	2.384	0.019	0.681	0.003	3.087
General Service (non-demand)	2.366	0.008	0.426	0.001	2.801
General Service (demand)	2.366	- [2]	- [3]	- [4]	2.366
Lighting	2.366	0.000	0.000	0.000	2.366

[1] The Residential Base Fuel Factor includes the Residential Energy Conservation Discount, Rider RECD-2C, adjustment factor of 0.7385%.

[2] The Proposed General Service (demand) Environmental Component is 1 cent per kW.

[3] The Proposed General Service (demand) Avoided Capacity Component is 88 cents per kW.

[4] The Proposed General Service (demand) DERP Avoided Cost Component is 0 cents per kW.